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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year)

11.05.2004

Applicant's or agent's file reference
PC-2016520

IMPORTANT NOTIFICATION

International application No.
PCT/EP 02/02152

International filing date (day/month/year)
28.02.2002

Priority date (day/month/year)
28.02.2002

Applicant
KONCENTRA HOLDING AB et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

Applicant's or agent's file reference PC-2016520	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 02/02152	International filing date (<i>day/month/year</i>) 28.02.2002	Priority date (<i>day/month/year</i>) 28.02.2002
International Patent Classification (IPC) or both national classification and IPC C23C4/00		
Applicant KONCENTRA HOLDING AB et al.		



1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

I	<input checked="" type="checkbox"/>	Basis of the opinion
II	<input type="checkbox"/>	Priority
III	<input type="checkbox"/>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	<input type="checkbox"/>	Lack of unity of invention
V	<input checked="" type="checkbox"/>	Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	<input type="checkbox"/>	Certain documents cited
VII	<input type="checkbox"/>	Certain defects in the international application
VIII	<input type="checkbox"/>	Certain observations on the international application

Date of submission of the demand 08.09.2003	Date of completion of this report 11.05.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Cappadonia, M Telephone No. +49 89 2399-8029 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP 02/02152

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-11 as originally filed

Claims, Numbers

1-25 filed with telefax on 22.04.2004

Drawings, Sheets

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/EP 02/02152**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	14-25
Inventive step (IS)	Yes: Claims	
	No: Claims	1-13
Industrial applicability (IA)	Yes: Claims	1-25
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP02/02152

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1: US 5 989 343 A (MARCUS PRESTON BOROM ET AL) 23 November 1999
- D2: US 3 066 042 A (JOSEPH OGDEN, MAYWOOD, N.J.) 27 November 1962
- D3: US 3 615 099 A (H.F. PRASSE) 26 October 1971
- D4: PATENT ABSTRACTS OF JAPAN vol.1997, no 11, 28 November 1997 (1997-11-28) & JP9196176 A (NIPPON PISTON RING CO LTD) 29 July 1997 (1997-07-29) abstract

D1 discloses a method for applying coatings at melting temperature, and it is less relevant for the new claims.

D2 discloses a method for applying a coating material comprising the steps of spraying the material, treating the material at elevated temperature below the melting point of the coating material, several layers can be applied (see D2, claim).

D3 and D4 disclose multilayer piston rings. The product claims 14-25 are product-by-process claims. Since a product is not novel just because it is produced by a novel method, said claims cannot be considered novel within the meaning of Art. 33(2) PCT.

Although D2 does not relate explicitly to piston ring technology, the subject-matter of the present claims 1-13 does not meet the requirements of Art. 33 (3) PCT. In fact the person skilled in the art, who would improve piston rings by multilayer deposition, would perform the deposition process according to D2 obtaining the subject-matter of the present independent claims without the exercise of an inventive step.

The fact that process according to D2 comprises other steps does not seem to be relaxant, since they are not excluded by the wording of the present claims.

The subject-matter of the remaining claims does not seem to meet the requirements of Art. 33(3) because it is not evident which problem of the state of the art is solved by the features of said claims, it is also noted that many technical features of the dependent claims do not concern directly the coating (see for examples claims 2,3,4).

Finally, the independent claims do not meet the requirements of art. 6 PCT since the

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP02/02152

temperature and the duration of the process are broadly and vaguely defined.

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CLAIMS

1. A method of applying a wear resistant coating material to a surface (22) of a piston ring (1), said method comprising the following steps, application of said coating material by a thermal spray process, heat treatment of said coating material at an elevated temperature and for a time effective to at least partially diffuse said coating material into the underlying surface, by exposing said material to heating temperature below the melting point of the coating material, and apply an additional coating material layer (24) subject to successive heat treatments of each said coating material layer (24) in order to lay down on said piston ring surface (22) a plurality of layers (24) of same said coating material.
2. A method according to claim 1, wherein said piston ring (1) is moved relatively to a thermal spray device (3) and a heat treatment device (5) while applying said coating material (4) and heat treatment to said piston ring (1).
3. A method according to any one of claims 1-2, wherein said piston ring (1) is rotated about its axis, in relation to a thermal spray device (3) and a heat treatment device (5), while continuously applying said coating material (4) and heat treatment.
4. A method according to any one of claims 1-3, wherein said heat treatment of said piston ring (1) is provided by induction.
5. A method according to any one of claims 1-4, wherein said resulting piston ring coating has an evenly distributed porosity.

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6. A method according to any one of claims 1-5, wherein said resulting piston ring coating has a porosity of between 1 to 15 vol%.
- 5 7. A method according to any one of claims 1-6, wherein said resulting piston ring coating comprises open pores (23).
- 10 8. A method according to any one of claims 1-7, wherein each of said coating material layer (24) typically has a thickness of between 0.005 to 0.4 mm.
- 15 9. A method according to any one of claims 1-8, wherein said coating material is of pulverulent type when fed to said thermal spray process.
- 20 10. A method according to any one of claims 1-8, wherein said coating material has a wire-like form when fed to said thermal spray process.
- 25 11. A method according to any one of claims 1-10, wherein said heat treatment result in necks (23) in contact points between particles (21) in at least said coating.
- 30 12. A method according to any one of claims 1-11, wherein said coating material comprises a metallic compound chosen from a group consisting of Cr_3C_2 , Cr_2O_3 and Al_2O_3 .
13. A method according to any one of claims 1-12, wherein said coating material is a cermet.

14. A piston ring (1) coated with a wear resistant coating material, by a thermal spray process, characterized in that said wear resistant coating has
5 been exposed to heat treatment of said coating material at an elevated heating temperature below the melting point of the coating material and for a time effective to at least partially diffuse said coating material into underlying surface,
10 and an additionally applied coating material layer (24) subject to successive heat treatments of each said coating material layer in order to provide on said piston ring surface (22) a plurality of layers (24) of same said coating material and wherein said piston ring comprising
15 necks (23) in contact points between particles (21) in at least said wear resistant coating.
15. A piston ring (1) according to claim 14, wherein said piston ring (1) is moved in relation to a thermal spray
20 device (3) and a heat treatment device (5) while applying said coating material (4) and heat treatment to said piston ring (1).
16. A piston ring (1) according to any one of claims 14-
25 15, wherein said piston ring (1) is rotated about its axis while continuously applying said coating material and heat treatment.
17. A piston ring (1) according to any one of claims 14-
30 16, wherein said heat treatment of said piston ring is provided by induction.
18. A piston ring (1) according to any one of claims 14-
35 17, wherein said piston ring coating has an evenly distributed porosity.

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19. A piston ring (1) according to any one of claims 14-18, wherein said piston ring coating has a porosity of between 1 to 15 vol%.

5 20. A piston ring (1) according to any one of claims 14-19, wherein said piston ring coating comprises open pores (23).

10 21. A piston ring (1) according to any one of claims 14-20, wherein each of said coating material layers (24) typically have a thickness of between 0.005 to 0.4 mm.

15 22. A piston ring (1) according to any one of claims 14-21, wherein said coating material is of pulverulent type when fed to said thermal spray process.

20 23. A piston ring (1) according to any one of claims 14-21, wherein said coating material has a wire like form when fed to said thermal spray process.

24. A piston ring (1) according to any one of claims 14-23, wherein said coating material comprises a metallic compound chosen from a group consisting of Cr_3C_2 , Cr_2O_3 and Al_2O_3 .

25 25. A piston ring (1) according to any one of claims 14-24, wherein said coating material is a cermet.

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CLAIMSREPLACED BY
ART 34 AMDT

1. A method of applying a coating material to a surface (22) of a piston ring (1), said method comprising the following steps, application of said coating material by a thermal spray process, heat treatment of said coating material at an elevated temperature and for a time effective to at least partially diffuse said coating material into the underlying surface, and apply an additional coating material layer (24) subject to successive heat treatments of each said coating material layer (24) in order to lay down on said piston ring surface (22) a plurality of layers (24) of same said coating material.
2. A method according to claim 1, wherein said piston ring (1) is moved relatively to a thermal spray device (3) and a heat treatment device (5) while applying said coating material (4) and heat treatment to said piston ring (1).
3. A method according to any one of claims 1-2, wherein said piston ring (1) is rotated about its axis, in relation to a thermal spray device (3) and a heat treatment device (5), while continuously applying said coating material (4) and heat treatment.
4. A method according to any one of claims 1-3, wherein said heat treatment of said piston ring (1) is provided by induction.
5. A method according to any one of claims 1-4, wherein said resulting piston ring coating has an evenly distributed porosity.

REPLACED BY
PART 34 AM9T

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6. A method according to any one of claims 1-5, wherein said resulting piston ring coating has a porosity of between 1 to 15 vol%.
- 5 7. A method according to any one of claims 1-6, wherein said resulting piston ring coating comprises open pores (23).
8. A method according to any one of claims 1-7, wherein
10 each of said coating material layer (24) typically has a thickness of between 0.005 to 0.4 mm.
9. A method according to any one of claims 1-8, wherein said coating material is of pulverulent type when fed to
15 said thermal spray process.
10. A method according to any one of claims 1-8, wherein said coating material has a wire-like form when fed to said thermal spray process.
- 20 11. A method according to any one of claims 1-10, wherein said heat treatment result in necks (23) in contact points between particles (21) in at least said coating.
- 25 12. A method according to any one of claims 1-11, wherein said coating material comprises a metallic compound chosen from a group consisting of Cr_3C_2 , Cr_2O_3 and Al_2O_3 .
13. A method according to any one of claims 1-12, wherein
30 said coating material is a cermet.
14. A piston ring (1) coated with a coating material by a thermal spray process,
exposed to heat treatment of said coating material at an
35 elevated temperature and for a time effective to at least partially diffuse said coating material into underlying surface,

**REPLACED BY
ART 34 AMDT**

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and an additionally applied coating material layer (24) subject to successive heat treatments of each said coating material layer in order to provide on said piston ring surface (22) a plurality of layers (24) of same said
5 coating material.

15. A piston ring (1) according to claim 14, wherein said piston ring (1) is moved in relation to a thermal spray device (3) and a heat treatment device (5) while applying
10 said coating material (4) and heat treatment to said piston ring (1).

16. A piston ring (1) according to any one of claims 14-15, wherein said piston ring (1) is rotated about its
15 axis while continuously applying said coating material and heat treatment.

17. A piston ring (1) according to any one of claims 14-16, wherein said heat treatment of said piston ring is
20 provided by induction.

18. A piston ring (1) according to any one of claims 14-17, wherein said piston ring coating has an evenly distributed porosity.
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19. A piston ring (1) according to any one of claims 14-18, wherein said piston ring coating has a porosity of between 1 to 15 vol%.

30 20. A piston ring (1) according to any one of claims 14-19, wherein said piston ring coating comprises open pores (23).

21. A piston ring (1) according to any one of claims 14-20, wherein each of said coating material layers (24) typically have a thickness of between 0.005 to 0.4 mm.
35

22. A piston ring (1) according to any one of claims 14-21, wherein said coating material is of pulverulent type when fed to said thermal spray process.
- 5 23. A piston ring (1) according to any one of claims 14-21, wherein said coating material has a wire like form when fed to said thermal spray process.
- 10 24. A piston ring (1) according to any one of claims 14-23, comprising necks (23) in contact points between particles (21) in at least said coating.
- 15 25. A piston ring (1) according to any one of claims 14-24, wherein said coating material comprises a metallic compound chosen from a group consisting of Cr_3C_2 , Cr_2O_3 and Al_2O_3 .
- 20 26. A piston ring (1) according to any one of claims 14-25, wherein said coating material is a cermet.